

Chapter 10

Adoption of Digital Technologies in Vietnamese Agriculture: Stakeholder Perspectives and Challenges

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10.1 Introduction

In the context of globalisation and rapid technological advancement, digital transformation has become a key factor in enhancing the efficiency and competitiveness of Viet Nam's agricultural sector. The integration of digital technologies across the entire agricultural value chain, from production and processing to distribution and consumption, not only optimises operations but also improves product quality to meet the stringent requirements of international markets. This transformation presents new opportunities for the sustainable development of Viet Nam's agriculture.

As consumer demand for high-quality agricultural products continues to grow, the adoption of digital technology in agricultural production and value chain management has become an inevitable trend. Several agricultural sectors have successfully pioneered digital transformation, achieving significant breakthroughs in productivity and product quality, thereby increasing the value of Vietnamese agricultural products in global markets.

In crop production, particularly in rice and vegetable farming, advanced technologies have been implemented to enhance productivity and efficiency. In the Mekong Delta, Viet Nam's largest rice-producing region, drones have been widely used for pesticide spraying and automated fertilisation. Additionally, several agricultural co-operatives in the region have introduced technologies such as field monitoring cameras and Internet of Things (IoT)-based systems to optimise irrigation and pest control. Moreover, remote sensing and satellite imaging technologies are extensively utilised for weather forecasting and crop monitoring, enabling farmers to make timely and informed decisions.

In addition to crop cultivation, the livestock and aquaculture industries are also at the forefront of digital technology adoption. In livestock farming, large-scale farms have implemented automated feeding systems, utilised smart sensors to monitor animal health, and adopted modern breeding management software. In aquaculture, particularly in shrimp and pangasius farming, two of Viet Nam's key export commodities, IoT sensor technology has been deployed to monitor water quality, detect early signs of disease, and optimise feed management. These advancements not only enhance productivity but also minimise environmental impacts.

Beyond production, digital technology has also driven significant transformations in supply chains and agricultural exports. For key export commodities such as coffee,

traceability and quality control technologies are being widely implemented to ensure transparency and meet the stringent requirements of international markets. Notably, blockchain technology has been piloted in the coffee supply chain, enhancing product reliability and brand value.

Despite its numerous benefits, Viet Nam's agricultural sector still faces several challenges in digital transformation. One of the most significant obstacles is farmers' access to technology, particularly in rural areas where digital literacy remains limited. Additionally, the lack of fully developed digital infrastructure hampers the widespread deployment of technological solutions. Overcoming these challenges requires close collaboration between the state government, technology enterprises, and farmers. In particular, training and raising awareness amongst farmers about the benefits of digital technology are crucial for its effective application in agricultural production.

This country case study was conducted by the Viet Nam Agricultural Market and Institution Research Institute (AMI) within the framework of the project 'Benefits and Challenges of Digitalisation in Agriculture and Food Systems for Enhanced Resilience and Improved Sustainability: Preliminary Assessment Study', led by the Economic Research Institute for ASEAN and East Asia (ERIA). The report utilises survey results from over 100 relevant stakeholders in agricultural product value chains in Viet Nam to assess the current status and potential for developing digitalisation applications in the country's agricultural sector.

10.2 Method

The data used in this report include both primary and secondary sources. Secondary data were collected from relevant documents, reports, and research articles related to the study's subject matter. Primary data were gathered from 103 stakeholders involved in the agricultural value chain in Viet Nam, including farmers, traders, input suppliers, consumers, and technology providers.

The survey questionnaire used in this study was developed by ERIA and adapted into Vietnamese by the research team to ensure contextual relevance. Data collection in the northern region was conducted directly by the research team from AMI. For the southern provinces, AMI provided training for local collaborators, who were also agricultural officers of the respective provinces, to carry out data collection and entry.

The study focuses on the rice sector to enable a comparative analysis amongst Association of Southeast Asian Nations (ASEAN) countries. Consequently, the survey sample focuses on the Viet Nam's largest rice-producing region, the Mekong River Delta, with 56 respondents, accounting for 54% of the sample. Other respondents were from provinces in the Red River Delta and Northern Mountainous areas, including Ha Noi, Nam Dinh, Bac Giang, Yen Bai, and Son La (Table 10.1).

Table 10.1. Map of Surveyed Areas



Source: Authors.

Surveyed province	Share (%)
Hanoi	22.33
Nam Dinh	4.85
Bac Giang	12.62
Son La	0.97
Ha Giang	4.85
An Giang	54.37

The main stakeholders include farmers, wholesalers, enterprises, distributors, co-operatives, technology providers, and consumers. Amongst them, farmers account for more than 81% of the total 103 respondents.

Table 10.2. Classification of Survey Respondents (%)

No.	Stakeholder	Paddy	Fruits/ vegetables (traditional)	Livestock and poultry	Aquacul- ture	Other*	All
1	Farmers	100.00	0.00	0.00	0.00	0.00	81.55
2	Wholesalers	60.00	20.00	20.00	0.00	0.00	4.85
3	Businesses	100.00	0.00	0.00	0.00	0.00	2.91
4	Distributors	100.00	0.00	0.00	0.00	0.00	0.97
5	Co-operatives	80.00	20.00	0.00	0.00	0.00	4.85
6	Technology providers	0.00	0.00	0.00	0.00	100.00	0.97
7	Consumers	100.00	0.00	0.00	0.00	0.00	1.94
8	Others*	0.00	0.00	0.00	0.00	100.00	1.94
	All	94.17	1.94	0.97	0.00	2.91	

* Agricultural product processing.

Source: Authors.

The interviewees produce a variety of products, including rice, fruits and vegetables, livestock, and poultry. Notably, 94% of the interviewed farmers are involved in rice cultivation (Table 10.2). Farmers in the north are more diversified, whilst farmers in the south are more specialised and commercialised. Other related stakeholders, such as processors, traders, distributors, are also mostly involved in rice production, processing, and sales.

Table 10.3. Survey Sample by Gender

No.	Gender	Share (%)
1	Male	62.14
2	Female	37.86

Source: Authors.

The selection of interview respondents was conducted to ensure representation of both men and women. However, in practice, agricultural production in Viet Nam is predominantly carried out by men, particularly in rice farming within the Mekong River Delta. As a result, male respondents constituted the majority, accounting for 62.14% of the survey sample (Table 10.3).

10.3 Data Analysis and Interpretation

10.3.1 Profile of Respondents

The majority of interview respondents have extensive experience in agricultural production. As shown in Table 10.4, nearly 47% of respondents have more than 20 years of experience, whilst those with less than 5 years of experience account for less than 12%. Farmers mostly have more than 20 years of experience. Meanwhile, wholesalers, co-operatives and consumers have many years of experience ranging from 5 years or more. Businesses have 11–20 years of experience, and technology suppliers also have 5–10 years of experience.

Table 10.4. Experience Classification by Stakeholder Type (%)

No.	Stakeholder	<5 years	5–10 years	11–20 years	>20 years
1	Farmers	14.29	8.33	26.19	51.19
2	Wholesalers	0.00	20.00	40.00	40.00
3	Businesses	0.00	0.00	100.00	0.00
4	Distributors	0.00	100.00	0.00	0.00
5	Co-operatives	0.00	40.00	20.00	40.00
6	Technology providers	0.00	100	0.00	0.00
7	Consumers	0.00	50.00	50.00	0.00
8	Others*	0.00	50.00	0.00	50.00
	All	11.65	13.59	28.16	46.60

* Processing facility.

Source: Authors.

The years of experience amongst stakeholders in the value chain are relatively similar, with most having at least 5 years of experience in their respective fields and many possessing over 20 years of experience. The majority of these stakeholders exhibit a high degree of specialisation and rarely change occupations; therefore, their years of experience are primarily correlated with their age (Table 10.5).

Table 10.5. Classification of Experience by Main Product (%)

No.	Main product	< 5years	5–10 years	11–20 years	>20 years
1	Paddy	12.37	11.34	28.87	47.42
2	Fruits/vegetables (traditional)	0.00	50.00	50.00	0.00
3	Livestock and poultry	0.00	0.00	0.00	100.00
4	Aquaculture	0.00	0.00	0.00	0.00
5	Fruits/vegetables (greenhouse)	0.00	0.00	0.00	0.00
6	Others	0.00	66.67	0.00	33.33

Source: Authors.

By product category, rice farmers exhibit the greatest diversity in years of experience, ranging from less than 5 years to more than 20 years (Table 10.5). This is partly due to the larger sample size for the rice sector, resulting in a more varied distribution of experience levels. In contrast, other sectors have smaller sample sizes, leading to lower representativeness in the results.

Table 10.6. Classification of Farmers Participating in Rice Products by Farm Size

No.	Farm size (hectares)	Share (%)
1	<0.5	35.71
2	0.5–3	50.00
3	>3	14.29

Source: Authors.

The scale of rice farms in Viet Nam remains relatively small. As seen in Table 10.6, over 35% of households cultivate less than 0.5 hectares (ha) of rice fields, primarily in the northern region. In contrast, farms in the southern region tend to be larger, with an average size of 1–2 ha per household. Approximately 50% of households have farm sizes ranging from 0.5 to 3 ha, whilst nearly 15% cultivate more than 3 ha of rice land.

Table 10.7. Classification of Educational Level by Stakeholder Type (%)

No.	Stakeholder	Elementary	Secondary/high school	Vocational/elementary	Higher
1	Farmers	16.67	73.81	3.57	5.95
2	Wholesalers	0.00	100.00	0.00	0.00
3	Businesses	0.00	33.33	0.00	66.67
4	Distributors	0.00	0.00	0.00	100.00
5	Co-operatives	0.00	0.00	20.00	80.00
6	Technology providers	0.00	0.00	0.00	100.00
7	Consumer	0.00	0.00	0.00	100.00
8	Others*	0.00	50.00	50.00	-
9	All	13.59	66.99	4.85	14.56

* Processing facility.

Source: Authors.

Low educational attainment is one of the major barriers to digital transformation in Viet Nam's agricultural sector. Statistics indicate that less than 10% of farming households have received vocational training or higher education. The majority have only completed lower or upper secondary education, whilst nearly 17% of the surveyed farmers have only completed elementary education. In contrast, other stakeholder groups have significantly higher educational levels, with most having attended short-term vocational training programmes or obtained a university degree (Table 10.7).

10.3.2 Current Status

10.3.2.1 Application of Digital Agriculture

Vietnamese agriculture has integrated various technologies into production, processing, and product commercialisation. With the exception of robotics, all other digital technologies mentioned in the survey have been adopted within Viet Nam's agricultural value chain. However, the degree of adoption and the prevalence of these technologies vary significantly (Table 10.8). Agricultural advisory applications (covering production, distribution, and consumption) are the most widely used, with approximately 52.43% of respondents, including farmers, wholesalers, enterprises, co-operatives, and technology providers, reporting their use. Amongst them, nearly 54% of surveyed farmers utilise these applications, predominantly in the southern region. Notable examples include advisory platforms developed by Lộc Trời Group, such as the Nông dân Lộc Trời app for farmers and the Đại lý Lộc Trời app for co-operatives and wholesalers, as well as the MEKONG RYNAN application by RYNAN Technologies Viet Nam.

Drones represent the second most adopted technology, with approximately 50% of respondents reporting usage. In agriculture, drones are employed in various activities,

including rice seeding, fertilisation, pesticide spraying, irrigation, field monitoring, pest surveillance, and yield forecasting. Currently, most farmers in the Mekong Delta are familiar with using drones for fertilisation and pesticide spraying, whereas adoption remains limited in northern Viet Nam. This discrepancy is largely due to differences in farm sizes; in the south, agricultural production is relatively large-scale, with the average farm size amongst surveyed households in An Giang being 2.8 hectares, whereas farms in the north are significantly smaller on average (Nam Định, 0.1 ha; Hà Nội, 0.27 ha; Bắc Giang, 0.67 ha).

Other technologies, such as IoT, automation, geographic information systems (GIS), artificial intelligence (AI), precision agriculture, and big data, are primarily adopted by co-operatives, businesses, and technology providers. As costs continue to decline and availability increases, these technologies are becoming more prevalent, particularly in the Mekong Delta, the largest commercial agricultural production region in Viet Nam.

Table 10.8. Rate of Application of Digital Technologies and Digital Tools in Agricultural Production by Actor (%)

No.	Technology	Farmers	Wholesaler	Businesses	Distributors	Co-operatives	Technology providers	Consumers	All
1	Farming advisory apps	53.57	40.00	100.00	0.00	60.00	100.00	0.00	52.43
2	Drones	54.76	0.00	33.33	1.96	60.00	0.00	0.00	49.51
3	IoT sensors	0.00	0.00	66.67	0.00	20.00	100.00	0.00	3.88
4	Robotics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Automation	0.00	0.00	66.67	33.3	0.00	100.00	0.00	3.88
6	Remote sensing and geographic information systems	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.97
7	Artificial intelligence	0.00	0.00	0.00	0.00	20.00	0.00	0.00	0.97
8	Precision agriculture	0.00	0.00	0.00	0.00	20.00	0.00	0.00	0.97
9	Data management software	0.00	0.00	66.67	0.00	60.00	100.00	0.00	5.83

Source: Authors.

The group of applications related to distribution, marketing, and finance has been widely adopted, particularly digital payment tools. According to the State Bank of Viet Nam, many financial institutions conduct over 90% of their transactions through digital channels, with approximately 77.41% of the adult population holding a bank account and more than 35 million active payment accounts (Minh Ánh, 2024). Given that the survey respondents were already users of digital tools, most of them reported having a bank account and having installed digital banking applications.

The survey results (Table 10.9) indicate that nearly 48% of respondents use digital applications for financial transactions between suppliers and buyers, whilst 40% utilise digital banking payment systems. This suggests that although the majority of respondents own smartphones and bank accounts, cash transactions remain a common practice for more than 50% of them. Meanwhile, despite e-commerce being recognised as an inevitable development trend and having experienced rapid growth in recent years, its application in the agricultural sector remains relatively limited. Currently, the e-commerce market accounts for approximately 10% of total retail goods and consumer service revenue, up from 8.5% in 2022. It is projected that Viet Nam's e-commerce sector will continue its strong expansion, with gross merchandise value expected to reach US\$16.8 billion by 2025 (Virac Research, 2024). However, only about 8% of respondents reported using digital marketplaces for agricultural production and consumption needs.

Table 10.9. Rate of Adoption of Digital Technologies and Digital Tools in Distribution, Marketing, and Finance by Actor (%)

No.	Stakeholder	Digital marketplace	Digital apps for financing and payment amongst suppliers and buyers	Digital payment systems with banks
1	Farmers	4.76	36.90	30.95
2	Wholesalers	0.00	80.00	60.00
3	Processors	33.33	100.00	100.00
4	Distributors	100.00	100.00	100.00
5	Co-operatives	20.00	80.00	40.00
6	Technology providers	100.00	100.00	100.00
7	Consumers	0.00	100.00	100.00
8	All	7.77	47.57	39.81

Source: Authors.

Digital technologies and tools in distribution, marketing, and finance have been integrated across the entire supply chain, particularly in commercial transactions. In 2023, mobile payments increased by 59.86% in volume and 12.73% in value, whilst QR code payments

surged by 242.46% in volume and 157.2% in value compared with the same period in 2022 (Trần Ngọc, 2024). This trend is also evident in the agricultural sector, where most stores, wholesalers, and distributors have adopted QR code payments or bank transfers. According to the survey, nearly 37% of farming households use digital applications to pay for agricultural inputs or receive payments from traders, whilst 31% conduct credit transactions through banking applications. Notably, nearly 100% of the remaining stakeholders in the agricultural value chain utilise banking applications for money transfers.

However, the adoption of digital technologies for farm product traceability in both domestic and international markets remains limited in Viet Nam. Amongst the 103 survey respondents (Table 10.10), none reported using blockchain technology to verify product information and manage logistics. Only about 1% indicated the use of sensors and IoT-based systems for agricultural product classification, whilst more than 17% applied QR codes or barcodes embedded with product information. This presents a significant challenge for Vietnamese agriculture, as product traceability has become an essential requirement in global supply chains. In Viet Nam, the demand for transparent product information is increasing due to economic integration and stringent regulations from international markets such as the European Union, the United States (Government Information Portal, 2025), and China (Ngọc Ánh and Thùy Linh, 2025).

Table 10.10. Rate of Application of Digital Technologies and Digital Tools in Digital Traceability of Farm Goods in Domestic and International Markets

No.	Digital technology or tool	Share (%)
1	Application of sensors and IoT-based systems for sorting farm produce	0.97
2	Blockchain technologies to identify product and logistics information	0.00
3	Inbuilt QR codes or barcodes containing product information	17.48

Source: Authors.

The adoption of traceability technology in the agricultural value chain remains inconsistent. By nature, traceability aims to collect information throughout the production, processing, and consumption stages. However, current traceability technologies are primarily implemented in processing and commercial activities, whilst their adoption in the production phase remains significantly limited. Specifically, most post-production stakeholders have a high adoption rate of QR codes or barcodes embedded with product information (67%–100%). In contrast, adoption rates amongst producers remain low, with co-operatives at 40% and farmers at only about 12% (Table 10.11).

Table 10.11. Application Rate of Inbuilt QR Codes or Barcodes Containing Product Information in Digital Traceability of Farm Goods in Domestic and International Markets by Actor

No.	Stakeholder	Share (%)
1	Farmers	11.90
2	Wholesalers	0.00
3	Businesses	66.67
4	Distributors	100.00
5	Co-operatives	40.00
6	Technology providers	100.00
7	Consumers	100.00

Source: Authors.

10.3.2.2 Stakeholders' Willingness to Adopt Digital Technologies

Overall, stakeholders in Viet Nam's agricultural value chain express interest in and willingness to adopt digital technologies (Table 10.12). All proposed technological solutions were selected by the survey respondents. Notably, solutions that provide direct support to agricultural production received the highest level of interest, including increasing agricultural yield and productivity (85% of respondents), reducing production/operational costs (85%), promoting environmentally friendly agricultural practices (59%), and optimising labour efficiency in activities such as irrigation, fertilisation, and livestock feeding (55%).

In contrast, more complex and indirectly impactful technological solutions received less attention, highlighting the limitations of current outreach efforts. For instance, only 9.7% of respondents expressed interest in adopting data management technologies, including data collection, analysis, storage, transfer, and sharing. This is concerning, as big data is not only a fundamental component of the Fourth Industrial Revolution but also serves as the backbone for key transformative technologies such as AI, machine learning, robotics, IoT, and blockchain.

Big data also plays a crucial role in enabling scientists, businesses, and policymakers to make informed decisions, develop effective solutions, and enhance service quality, ultimately improving human well-being. Furthermore, it has fuelled the growth of a global market worth hundreds of billions of US dollars annually (Khôi Nguyên et al., 2025) and has been demonstrated as a powerful tool in agriculture through numerous scientific studies (Yu and Migliaccio, 2023; Cravero et al., 2022; Chergui and Kechadi, 2022). These findings indicate that many stakeholders have yet to fully grasp the value of technological solutions in the agriculture and food value chain.

Table 10.12. Share of Respondents Wanting to Apply Digital Solutions to Areas in the Agriculture and Food Value Chain

No.	Area	Share (%)
1	Increasing agricultural production and productivity	85.44
2	Reducing production/operation costs	85.44
3	Appropriate labour saving in agricultural production methods, such as irrigation, fertilisation, and feeding	55.34
4	Dealing with labour shortages	17.48
5	Enhancing the quality of farm production	24.27
6	Reducing post-harvest losses, and food loss and waste	38.83
7	Mitigating the impact of climate change (floods, droughts, etc.)	17.48
8	Promoting more environmentally friendly agriculture, including the reduction of greenhouse gas emissions	59.22
9	Exploring new marketing opportunities	20.39
10	Increasing food safety	24.27
11	Assuring consumers of the origin and quality of products	22.33
12	Data management: data collection, analysis, storage, transfer, and sharing	9.71
13	Applying for support, such as subsidies and insurance, in agriculture (e.g. e-government platforms)	13.59
14	Others*	0.97

* Advertisement.

Source: Authors.

10.3.2.3 Reasons for Using Digital Agriculture

Overall, awareness of and interest in technological solutions vary significantly amongst different respondent groups (Table 10.13). Farmers primarily seek technologies that support production, reduce labour, and increase income, whereas other stakeholder groups demonstrate a broader interest in digital solutions. Specifically, more than 90% of farmers expressed a strong desire for technologies that enhance agricultural yield and productivity whilst reducing production and operational costs. Additionally, they showed interest in labour-saving solutions in agricultural production (58.33%) and post-harvest loss and food waste reduction (36.90%). Wholesalers prioritised reducing production and operational costs (100%) alongside increasing agricultural yield and productivity (80%). They were also interested in labour-saving measures (60%) and exploring new marketing opportunities (60%).

Enterprises aimed to leverage digital solutions to enhance food safety (100%) and mitigate the effects of climate change (100%). They also focused on improving agricultural product quality (66.67%) and expanding marketing opportunities (66.67%). Distributors exhibited

a strong interest in adopting digital solutions across nearly all aspects of the agriculture and food value chain (100%). This included increasing production, reducing costs, saving labour, addressing labour shortages, enhancing product quality, minimising post-harvest losses, reducing climate change impacts, promoting environmentally friendly agricultural practices, exploring new marketing opportunities, ensuring food safety, improving traceability, and managing data efficiently.

Co-operatives primarily focused on increasing agricultural yield and productivity (80%) and reducing production/operational costs (60%). They also showed moderate interest in labour-saving solutions (40%) and post-harvest loss reduction (60%). Technology providers aimed to adopt digital solutions to boost productivity, lower costs, save labour, enhance product quality, and optimise data management. Finally, consumers demonstrated particularly high interest in improving agricultural product quality (100%), enhancing food safety (100%), and ensuring product traceability (100%).

Table 10.13. Share of Actors Wanting to Apply Digital Solutions to Areas in the Agriculture and Food Value Chain (%)

No.	Area	Farmers	Wholesalers	Businesses	Distributors	Co-operatives	Technology providers	Consumers
1	Increasing agricultural production and productivity	90.48	80.00	66.67	100.00	80.00	100.00	0.00
2	Reducing production/operation costs	90.48	100.00	33.33	100.00	60.00	100.00	0.00
3	Appropriate labour saving in agricultural production methods, such as irrigation, fertilisation, and feeding	58.33	60.00	33.33	100.00	40.00	100.00	0.00
4	Dealing with labour shortages	16.67	20.00	66.67	100.00	0.00	0.00	0.00
5	Enhancing the quality of farm production	20.24	40.00	66.67	100.00	0.00	100.00	100.00
6	Reducing post-harvest losses, and food loss and waste	36.90	40.00	33.33	100.00	60.00	0.00	50.00
7	Mitigating the impact of climate change	15.48	20.00	100.00	100.00	0.00	0.00	0.00
8	Promoting more environmentally friendly agriculture, including the reduction of greenhouse gas emissions	63.10	20.00	33.33	100.00	60.00	100.00	50.00
9	Exploring new marketing opportunities	14.29	60.00	66.67	100.00	40.00	0.00	0.00
10	Increasing food safety	15.48	40.00	100.00	100.00	40.00	0.00	100.00
11	Assuring consumers of the origin and quality of products	15.48	40.00	33.33	100.00	20.00	100.00	100.00

12	Data management: data collection, analysis, storage, transfer, and sharing	5.95	20.00	66.67	100.00	0.00	100.00	0.00
13	Applying for support, such as subsidies and insurance, in agriculture	13.10	20.00	0.00	100.00	20.00	0.00	0.00
14	Others*	0.00	0.00	0.00	0.00	20.00	0.00	0.00

* Advertisement.

Source: Authors.

10.3.2.4 Challenges

Although respondents expressed a strong desire to adopt various technological solutions, they also highlighted multiple challenges and barriers to implementation (Table 10.14). The primary difficulties include a lack of basic infrastructure (accessibility and affordability), shortages in human resources, financial and institutional constraints, and difficulties in managing digitalised data and information transfer.

Regarding infrastructure, the two most significant challenges identified were the low level of mechanisation and the small land sizes of farmers. More than 50% of respondents stated that mechanisation remains underdeveloped, whilst nearly 43% considered small farm sizes a major obstacle. As previously analysed, the Mekong Delta region has a larger average farmland size (2.8 ha per household), leading to a significantly higher adoption rate of mechanisation (e.g. drones) and digital technology compared to the northern region, which averages only 0.1–0.67 ha per household. These findings suggest that these two factors are the biggest bottlenecks in the adoption of technology in Viet Nam.

Furthermore, different stakeholder groups expressed specific concerns (Table 10.15). Wholesalers were mainly concerned about access to broadband Internet (60%) and underdeveloped mechanisation, including a lack of equipment and tools (60%). Businesses cited the lack of mechanisation, equipment, and tools (66.67%) and small farm sizes (33.33%) as key barriers to adopting digital technology. Distributors identified the most significant challenges as underdeveloped mechanisation, lack of equipment and tools (100%), limited access to broadband internet (100%), small farm sizes (100%), and the impact of natural disasters due to climate change (100%). Co-operatives expressed concerns about the low level of mechanisation and lack of equipment and tools (60%), small farmland sizes (60%), and climate-related disasters (20%). Technology providers were primarily worried about the lack of mechanisation, equipment, and tools. Consumers were particularly concerned about underdeveloped mechanisation and a lack of equipment and tools (100%), small farm sizes (100%), and access to broadband internet (50%).

Table 10.14. Challenges, Limitations, and Infrastructure Obstacles When Applying Digital Technology and Digital Tools

Challenge	Share (%)
Availability of uninterrupted electricity supply	5.83
Access to broadband internet access	20.39
Farmers' land size	42.72
Climate-induced natural disasters, including frequent floods, droughts, and landslides	25.27
Underdeveloped mechanisation (lack of equipment and tools)	50.49

Source: Authors.

More than 47% of farmers said that underdeveloped mechanisation and a lack of equipment and tools are infrastructure challenges when applying digital technology. In addition, land area (42.86%) is also one of the major challenges. Wholesalers are mainly concerned about access to broadband internet (60%) and underdeveloped mechanisation, including a lack of equipment and tools (60%). Businesses said that underdeveloped mechanisation, including a lack of equipment and tools (66.67%), and farmers' land size (33.33 %) are obstacles to applying digital technology. Distributors said that the constraints include underdeveloped mechanisation, lack of equipment and tools (100%), access to broadband internet (100%), farmers' land size (100%), and natural disasters due to climate change (100%). Co-operatives are concerned about underdeveloped mechanisation, including a lack of equipment and tools (60%), farmers' land area (60%), and natural disasters due to climate change (20%). Technology suppliers are mainly concerned about underdeveloped mechanisation and a lack of equipment and tools. Consumers are concerned about underdeveloped mechanisation and a lack of equipment and tools (100%), farmers' land area (100%), and access to broadband internet (50%).

Table 10.15. Challenges, Limitations, and Infrastructure Obstacles When Applying Digital Technology and Digital Tools by Actor (%)

Challenge	Farmers	Wholesalers	Businesses	Distributors	Co-operatives	Technology providers	Consumers	All
Availability of uninterrupted electricity supply	5.95	0.00	0.00	0.00	0.00	0.00	0.00	5.83
Access to broadband internet access	19.05	60.00	0.00	100.00	0.00	0.00	50.00	20.39
Farmers' land size	42.86	20.00	33.33	100.00	60.00	0.00	100	42.72

Climate-induced natural disasters, including frequent floods, droughts, and landslides	27.38	0.00	0.00	100.00	20.00	0.00	0.00	25.27
Underdeveloped mechanisation (lack of equipment and tools)	47.62	60.00	66.67	100.00	60.00	100	100.00	50.49

Source: Authors.

Regarding challenges related to human resources, the survey results indicate that whilst most respondents are willing to adopt and embrace technology, they struggle with a lack of knowledge and high-quality personnel (Table 10.16). Only about 9% of respondents identified a conservative mindset or resistance to change as a barrier to technology adoption. In contrast, the biggest concern is the shortage of personnel with expertise in existing and emerging digital technologies in the agricultural sector, highlighted by 72% of respondents.

In reality, 81% of respondents and more than 90% of interviewed farmers have only primary or lower secondary education. This poses significant challenges for them in learning, exploring, and utilising complex technologies. Furthermore, respondents pointed out specific difficulties in training, including that more than 50% believe there is a shortage of agricultural extension officers and digital technology service providers with the necessary digital skills. Some 30% identified a lack of digital skills or training along the value chain, whilst 29% pointed out a lack of digital skills or training at the farm level. These findings highlight the urgent need to enhance digital literacy and technical training for workers in the agricultural sector.

Different stakeholder groups in the value chain have varying perspectives on the challenges of technology adoption. However, they generally agree that a lack of knowledge is the most significant obstacle. More than 72% of farmers consider the lack of digital literacy in both existing and emerging technologies to be one of the major human resource challenges when adopting digital technology. Additionally, 55.95% believe that the shortage of skilled digital service providers and personnel is another major barrier. Approximately 80% of wholesalers identify low digital literacy and the lack of digital skills or training along the value chain as the biggest challenges. Similarly, businesses (processors) are particularly concerned about digital literacy (66.67%) and the lack of digital skills or training at the farm level (66.67%).

Distributors perceive all these challenges as barriers to human resource readiness for digital technology adoption. Amongst co-operatives, 60% express concerns about digital literacy, another 60% about the shortage of skilled digital service providers, and 40% see the lack of digital skills or training along the value chain as a significant challenge.

Technology providers highlight the shortage of skilled personnel and digital service providers as their primary concern. Meanwhile, consumers consider digital literacy to be the most critical challenge (100%). These findings underscore the urgent need to enhance digital literacy and specialised training across the entire agricultural value chain.

Table 10.16. Challenges, Limitations, and Human Resource Obstacles When Applying Digital Technology and Digital Tools by Actor (%)

Challenge	Farmers	Wholesalers	Business	Distributors	Co-operatives	Technology providers	Consumers	All
Digital literacy regarding available and potential digital technologies	72.62	80.00	66.67	100.00	60.00	0.00	100.00	71.84
Lack of extension workers and digital technology service providers with digital skills	55.95	0.00	0.00	0.00	60.00	100.00	0.00	50.49
Lack of digital skills or training at the farm level	29.76	40.00	66.67	100.00	0.00	0.00	0.00	29.13
Lack of digital skills or training along the value chain	26.19	80.00	33.33	100.00	40.00	0.00	0.00	30.10
Conservative attitudes, such as resistance to change	5.95	20.00	0.00	100.00	20.00	0.00	0.00	8.74

Source: Authors.

In addition to human resources, 100% of survey respondents identified financial constraints as a major challenge to the widespread adoption of digital technology. Amongst these, the high cost of technology adoption was the most significant financial barrier, with 93% of respondents highlighting it as the biggest concern (Table 10.17).

According to the General Statistics Office, in 2023, Viet Nam's average monthly income was nearly D5 million, whilst income from agriculture, forestry, and fisheries was only D502,000 per month. Meanwhile, digital technologies remain expensive. For instance, a fertiliser and pesticide spraying drone costs over D200 million (Dong Nai Newspaper, 2024), which is equivalent to more than 3 years of total income for an average individual or over 33 years' worth of agricultural income. As a result, most widely adopted technologies require business investment and large-scale applications. More localised technologies, such as sensors and IoT, are less common and mainly used in high-value agricultural sectors such as aquaculture.

Due to high adoption costs, most respondents reported struggling to invest, whilst 29% of respondents cited a lack of financial incentives for infrastructure development and training programmes. Additionally, 16% noted limited public support for promoting digital technology, and 5% reported difficulties in accessing preferential loans and credit.

Overall, the different value chain actors had similar views on the financial challenges of adopting digital technology. Nearly 93% of farmers considered high costs to be the biggest financial barrier. All wholesalers regarded high adoption costs as a major issue. Over 67% of businesses cited both high costs and the lack of financial incentives for infrastructure and training as key challenges. Distributors were concerned about multiple issues, including high costs, lack of financial incentives, and limited government support. All co-operatives identified high costs as the most significant challenge. Technology providers were primarily concerned with investment costs and the lack of financial incentives for infrastructure and training. Similarly, all consumers saw high costs as the biggest barrier to accessing technology-enabled agricultural products.

Table 10.17. Financial Challenges, Limitations, and Obstacles When Applying Digital Technology and Digital Tools (%)

Challenge	Farmers	Wholesalers	Business	Distributors	Co-operatives	Technology providers	Consumers	All
High cost of adopting new technologies	92.86	100.00	66.67	100.00	100.00	100.00	100.00	93.20
Lack of financial incentives for developing infrastructure and training programmes	29.76	0.00	66.67	100.00	20.00	100.00	0.00	29.13
Limited public support for the uptake of digital technology	14.29	0.00	0.00	100.00	20.00	0.00	0.00	15.53
Access to concessionary loans and credit	5.95	0.00	0.00	0.00	0.00	0.00	0.00	4.85
Others	0.00	0.00	0.00	0.00	20.00	0.00	0.00	0.97

Source: Authors.

Institutional constraints have been identified as significant barriers to the widespread adoption of digital technology, particularly regarding policy frameworks and support mechanisms for agricultural digitalisation (Table 10.18). The Vietnamese government has recognised the importance of digital transformation, especially in the context of the Fourth Industrial Revolution. On 31 December 2020, the Prime Minister issued the national

strategy for the Fourth Industrial Revolution to 2030. Since then, numerous policies have been introduced to promote digital transformation, including in the agricultural sector.

Table 10.18. Institutional Challenges, Limitations, and Obstacles When Applying Digital Technology and Digital Tools (%)

Challenge	Farmers	Wholesalers	Businesses	Distributors	Co-operatives	Technology providers	Consumers	All
Limited policy instruments and framework conditions that support agricultural digitalisation	64.29	40.00	66.67	0.00	60.00	100.00	0.00	60.19
Lack of intergovernmental co-ordination and/or organisational structure	3.57	0.00	0.00	0.00	40.00	100.00	0.00	5.83
Inconsistent government strategies and frequent changes in farm policy	7.14	0.00	0.00	0.00	0.00	0.00	0.00	5.83
Lack of co-ordinated operations amongst public–private and local stakeholders	25.00	40.00	33.33	100.00	40.00	100.00	0.00	28.16
Others*	0.00	0.00	0.00	0.00	20.00	0.00	0.00	0.97

*Lack of implementation from government agencies.

Source: Authors.

However, shown in Table 10.18, more than 64% of farmers perceive restrictive policies and inadequate institutional frameworks as major institutional challenges in adopting digital technology. Similarly, about 40% of wholesalers consider these policy limitations, along with a lack of co-ordination between public–private stakeholders and local authorities, to be significant obstacles. More than 66% of businesses also identify policy constraints and weak institutional support for digitalisation as persistent challenges. Distributors report major difficulties due to insufficient co-ordination amongst public and

private sector actors and local authorities. Co-operatives face challenges related to restrictive policies and inadequate digitalisation frameworks (60%), as well as poor intergovernmental and organisational co-ordination (40%). Technology providers similarly highlight policy limitations and weak institutional frameworks as key challenges, in addition to insufficient co-ordination between governmental bodies and other stakeholders.

Table 10.19. Challenges, Limitations, and Obstacles in Digital Data Management and Information Transfer When Applying Digital Technology and Digital Tools (%)

Challenge	Farmers	Wholesalers	Businesses	Distributors	Co-operatives	Technology providers	Consumers	All
Digitalised data availability and the cost of digitalisation	14.29	0.00	33.33	100.00	0.00	100.00	0.00	15.53
Lack of facilities for data provided by the public or private sector, such as soil maps and market information	17.86	20.00	0.00	100.00	40.00	100.00	0.00	21.36
Cybersecurity threats	58.33	40.00	66.67	0.00	60.00	0.00	0.00	55.34
Software management in local languages for data integration and data sharing	1.19	20.00	33.33	0.00	40.00	0.00	0.00	4.85

Source: Authors.

A significant portion of respondents identified challenges related to the management of digital data and information transfer. Unlike other challenges, which were acknowledged by 100% of respondents, only 81% recognised issues stemming from data management and information exchange. The primary concerns in this area are shown in Table 10.19 and include cybersecurity threats (cited by 55% of respondents), a lack of data provision infrastructure (21%), and the availability and cost of digitalisation (16%). Additionally, 5% of respondents highlighted difficulties in managing software in local languages for data integration and sharing.

Clearly, this is a substantial and pressing challenge, as evidenced by the estimated 659,000 cyberattacks nationwide in 2024. According to a report from the Department of Cybersecurity and High-Tech Crime Prevention under the Ministry of Public Security, over 74,000 cybersecurity warnings were issued for critical institutions alone, including 83 targeted advanced persistent threat campaigns (VTV, 2024). These findings underscore the urgent need for robust cybersecurity measures and improved data management

infrastructure to facilitate the secure and efficient adoption of digital technology in agriculture.

10.3.2.5 Private Sector Involvement

As analysed above, the adoption of technology requires the participation of private enterprises due to high investment costs. However, the level of support from the private sector remains very low, leading to limited technology adoption. According to the survey results, only 5% of respondents received direct support for technology adoption from private enterprises, whilst 93% reported receiving no support, and 2% were uncertain (Table 10.20).

Table 10.20. Private Sector Support Received for the Adoption of Digital Technologies and Tools

Support received	Share (%)
Yes	4.85
No	93.20
Unsure	1.94

Source: Authors.

The primary reason for this is that businesses typically invest in technology and provide farmers with paid services rather than direct financial support. For example, Lộc Trời Group invests in agricultural drones and offers spraying services for a fee to farmers who need them. Financial support for purchasing technological solutions, training, or equipment demonstrations is limited to a small group of beneficiaries, usually through pilot models (Table 10.22). These forms of support may come from various types of private sector entities, including multinational corporations, local agribusinesses, startups, and subsidiaries of retail companies (either buyers or intermediaries), as shown in Table 10.21.

Table 10.21. Private Sector Support Received for the Adoption of Digital Technologies and Tools by Private Sector Type

Private sector type	Share (%)
Multinational company	20.00
Local farm enterprises	20.00
Startups	40.00
Subsidiaries of retail companies (buyers or intermediaries)	20.00
Others*	60.00

* Two people received support from a co-operative and one person from the World Bank.

Source: Authors.

Table 10.22. Private Sector Support Received for the Adoption of Digital Technologies and Tools by Type of Support (%)

Support type	Share (%)
Financial support for purchasing digital technology solutions	0.00
Training to use digital services	60.00
Demonstrations for the introduction of equipment	40.00
Appropriate use of digital data services and marketplaces	20.00

Source: Authors.

12.3.2.6 Expectations of Digital Technologies

Technological solutions are expected to have a significant impact on the future of agriculture in ASEAN in the medium to long term. Amongst these, drones, one of the most widely adopted technologies today, continue to be highly regarded for their potential in transforming agricultural production. According to the survey results, 78% of respondents believe that drones will have a major impact on agriculture in the coming years (Table 10.23).

A report from Da Jiang Innovations (DJI) highlights the increasing global adoption of agricultural drones, with these devices covering more than 500 million ha of farmland worldwide by the end of June 2024. Their efficiency has resulted in substantial resource savings, including a total reduction of 210 million tonnes of water and 47,000 tonnes of pesticides. Additionally, the use of agricultural drones has significantly cut carbon emissions by approximately 25.72 million tonnes, equivalent to the carbon absorption of 1.2 billion trees, demonstrating the sustainability and environmental benefits of this innovative approach to modern agriculture (VietnamPlus, 2024).

The same report also presents findings on the effectiveness of drones in various agricultural applications. For instance, in Mexico, drone-based herbicide spraying on agave farms reduced water usage by 88% and lowered costs by more than US\$60 per ha. In Australia, targeted herbicide spraying on grasslands reduced chemical usage by 51% and cut costs by 50%. In Thailand, pesticide spraying on a 1,500-tree durian orchard resulted in a 20%–30% reduction in chemical use. In South Africa, ripening agent application on small-scale sugarcane farms increased final sugar yield by up to 1.78 tonnes per ha (VietnamPlus, 2024). These examples illustrate the growing adoption of drones across ASEAN and their long-term benefits for agricultural productivity and sustainability.

Table 10.23. Share of Predicted Digital Technologies That Will Have the Greatest Impact on the Future (Medium- to Long-term) of Agriculture in ASEAN (%)

Digital technology	Farmers	Wholesalers	Businesses	Distributors	Co-operatives	Technology providers	Consumers	All
Drones	85.71	60.00	33.33	100.00	40.00	0.00	50.00	77.67
IoT sensors	19.05	20.00	0.00	100.00	20.00	0.00	100.00	21.36
Artificial intelligence	25.00	0.00	100.00	100.00	40.00	100.00	50.00	30.10
Robots	32.14	60.00	33.33	100.00	20.00	100.00	50.00	35.92
Automation	33.33	60.00	33.33	100.00	20.00	100.00	50.00	36.89
Digital marketplace and e-commerce	46.43	100.00	66.67	100.00	100.00	100.00	100.00	55.34
Big data analytics	9.52	0.00	33.33	100.00	20.00	100.00	100.00	13.59
Blockchain	0.00	0.00	33.33	100.00	0.00	0.00	50.00	2.91

Source: Authors.

Apart from drones, 55% of respondents believe that the expansion of e-commerce will significantly impact ASEAN agriculture in the near future. Other technological solutions also received notable recognition, with automation (37%), robotics (36%), AI (30%), IoT (21%), and big data (14%) all seen as having considerable influence on agricultural production. However, blockchain technology was rated as impactful by only 3% of respondents. This perception, however, may need to be reconsidered. Given that most ASEAN countries have a trade surplus in agricultural exports, and destination markets are increasingly enforcing stricter traceability regulations, blockchain will likely become a crucial technology for ensuring transparency and compliance in agricultural trade.

10.4 Overview of Policies, Government Initiatives, and Programmes for Promoting the Utilisation of Digital Technologies in Agriculture and Food Systems

10.4.1 Government Policies and Initiatives

Digital agriculture transformation and the application of high technologies are pivotal to enhancing productivity, ensuring food security, and fostering sustainable development. Recognising this, the Vietnamese government has implemented several policies and initiatives aimed at promoting the integration of digital technologies into agriculture and food systems. These strategic policies focus on modernising agricultural practices,

building digital ecosystems, and enhancing the competitiveness of Vietnamese agricultural products in the global market.

The National Digital Transformation Program was approved by the Prime Minister of Viet Nam on 3 June 2020 under Decision No. 749/QĐ-TTg. This policy aims to accelerate digital transformation across all sectors of the economy, with agriculture identified as one of eight priority sectors. The programme emphasises the development of smart agriculture and precision farming to increase the proportion of digital agriculture in the national economy. It also focuses on building big data systems for land management, automating production processes, and enhancing traceability to ensure food safety and disease control. By 2030, Viet Nam aims to become a digital nation, leveraging digital technologies to boost economic growth and innovation. In agriculture, the programme sets the foundation for building digital platforms that connect stakeholders, enhance information transparency, and support data-driven decision-making. It also encourages the application of AI, IoT, and blockchain technologies in farming practices, which are expected to improve productivity, reduce costs, and enhance sustainability.

In 2021, the Prime Minister of Viet Nam issued Decision No. 130/QĐ-TTg to launch the National Program on High Technology Development until 2030. This programme aims to promote research, development, and the application of high technologies across various sectors, with a special focus on agriculture. The policy encourages the use of advanced technologies such as AI, blockchain, and IoT in agricultural production to increase productivity and economic efficiency. To support this initiative, the Ministry of Agriculture and Rural Development issued Decision No. 3070/QĐ-BNN-KHCN in 2021, which outlines the framework for developing high-tech agriculture under this national programme. The programme focuses on building smart agriculture models that apply digital technologies for efficient resource utilisation, improving the quality of agricultural products, and enhancing food safety standards. It also promotes digital value chains linked to e-commerce platforms to provide better market access for farmers and agricultural enterprises. This initiative aims to establish digital agriculture zones and encourage public-private partnerships for technology adoption. It also develops high-tech agricultural products with high added value, contributing to the sustainable development of Viet Nam's agricultural sector.

The High-Tech Agriculture Development Plan was approved by the Prime Minister of Viet Nam in 2012 under Decision No. 176/QĐ-TTg and Decision No. 1895/QĐ-TTg. This productivity plan focuses on fostering the development of high-tech agriculture to enhance the quality and competitiveness of Vietnamese agricultural products. It emphasises the establishment of high-tech agricultural zones and the implementation of advanced production models, including precision farming, biotechnology, and automated irrigation systems. Since its implementation, the plan has contributed to the formation of high-tech agricultural regions with modern infrastructure and production techniques. It has also promoted collaboration between research institutions and enterprises, facilitating technology transfer and the commercialisation of research outcomes.

Additionally, the programme has helped to build value chains for agricultural products, enhance traceability, and meet international food safety standards.

10.4.2 Effectiveness of Government Initiatives, Programmes, and Support

Overall, government support for digital technology adoption remains limited. Only about 39% of respondents reported receiving at least one form of government assistance, with the following distribution: 12% received both financial and technical support, 1% received a combination of technical support and physical resources, 3% received only financial support, and 23% received only technical support.

Amongst those who received financial support, 87% stated that the funding was insufficient for technology implementation, whilst only 13% considered it adequate. Similarly, 76% of recipients of technical support indicated that the assistance was inadequate for adopting digital technologies, with only 24% rating it as sufficient.

In general, government support policies in Viet Nam do not fully cover the needs of businesses and individuals but instead follow a co-investment approach, requiring financial contributions from beneficiaries. As a result, the high proportion of financial aid recipients who find the support insufficient is understandable.

Table 10.24. Receipt of Government Support for Adopting Digital Technologies and Tools by Type of Support

Support type	Share (%)	Support rating: met needs (%)
Financial support	14.56	13.33
Technical support	35.92	24.32
In-kind support	0.97	0.00

Source: Authors.

Additionally, the public faces significant challenges in accessing government support policies, resulting in a low rate of policy beneficiaries. As previously analysed, despite the government's efforts to promote and support high-tech adoption, around 60% of surveyed individuals reported not receiving any assistance for technology implementation.

This situation is largely attributed to limited awareness of existing policies, as well as constraints related to policy implementation resources. Although awareness of individual policies remains low, ranging from 7.77% to 15.53% depending on the policy (Table 10.25), only 23% of respondents reported being aware of at least one policy related to digital agriculture, indicating that the majority of respondents were unaware of the government initiatives aimed at fostering high-tech agricultural development.

Table 10.25. Awareness of Policies Aimed at Applying Digital Technologies and Digital Tools (%)

Policy	Share (%)
Decision No. 749/QD-TTg issued on 3 June 2020	15.53
Decision No. 130/QD-TTg in 2021 and Decision No. 3070/QD-BNN-KHCN in 2021	13.59
Decision No. 176/QD-TTg and Decision No. 1895/QD-TTg in 2012	7.77
Other*	0.97

* Agricultural promotion policy.

Source: Authors.

Nevertheless, the majority of those aware of the policies acknowledged their supportive role in agricultural production (Table 10.26). This indicates that whilst the government has introduced well-designed policies, challenges persist in effectively communicating and implementing them amongst the public. Specifically, amongst the 24 respondents who were aware of these policies, 75% agreed that the policies provided support for their agricultural activities, whilst 21% slightly agreed (Table 10.26).

Table 10.26. Opinions on Policies Aimed at Adopting Digital Technologies and Digital Tools

Opinion	Share (%)
Agree	75.00
Slightly agree	20.80
Neither	4.20
Slightly disagree	0.00
Disagree	0.00

Note: N = 24 (people who are aware of the supporting policies for adopting digital technologies and digital tools).

Source: Authors.

10.5 Recommendations

10.5.1 Enhancing Awareness and Building Digital Capacity

Raising awareness and developing digital capacity are critical for the successful adoption of technology in agriculture. Training and capacity-building programmes should be tailored to different user groups, including farmers, agricultural co-operatives, and agribusinesses. These programmes should focus on the practical application and benefits of digital technologies such as drones, IoT sensors, data management software, and e-commerce platforms. Additionally, training initiatives should introduce other advanced

technological solutions, including big data and blockchain, to help stakeholders understand their potential value.

Furthermore, strengthening the digital competencies of agricultural extension officers is essential. Providing them with digital skills and technical tools will enable them to better support farmers in adopting new technologies. Collaboration in education is equally important. Partnerships between academic institutions and technology enterprises should be encouraged to integrate digital agriculture into university curricula and vocational training programmes. This initiative will help cultivate a skilled workforce equipped with the necessary expertise to drive the digital transformation of the agricultural sector.

10.5.2 Rationalising Agricultural Production Planning

A well-structured agricultural production strategy is crucial for maximising the benefits of technology adoption. Expanding large-scale farming models can enhance the efficiency of digital and mechanised farming whilst reducing investment costs and increasing productivity. Establishing specialised farming zones will also facilitate the systematic application of digital tools.

In addition, strengthening production linkages is vital. Agricultural co-operatives and producer organisations play a key role in consolidating smallholder farms into larger operational units, making it easier to implement digital and mechanised farming practices. Enhanced collaboration amongst stakeholders will create economies of scale, further supporting the widespread adoption of digital technologies.

10.5.3 Investment in Digital Infrastructure and Data Ecosystems

The expansion of high-speed internet coverage is a fundamental prerequisite for digital agriculture. Accelerating the deployment of broadband internet, particularly in rural and large-scale farming areas, will ensure the seamless operation of digital devices and smart farming technologies.

Developing a national agricultural data ecosystem is also essential. This system should integrate critical information, including weather conditions, soil quality, market prices, and production statistics. It must be designed to be easily accessible to farmers, agribusinesses, and policymakers to support data-driven decision-making. In parallel, blockchain technology should be developed for traceability applications, ensuring transparency and reliability in the agricultural supply chain.

Additionally, cybersecurity measures must be reinforced alongside technological advancements. Governments should implement robust cybersecurity strategies to safeguard digital agricultural data from cyber threats, ensuring data privacy and integrity across the entire digital agricultural value chain.

10.5.4 Financial Support and Investment Incentives

Financial support mechanisms are essential to encourage investment in agricultural technology. Governments and technology providers should establish preferential loan programmes and subsidies to alleviate the financial burden on farmers and agribusinesses when adopting digital solutions.

Investment incentives should also be introduced to attract private sector participation in high-tech agriculture. Policies such as tax reductions, land-use incentives, and research and development grants should be implemented to encourage technological innovation and digital technology transfer. Additionally, promoting the socialisation of investment in digital agricultural equipment and supporting pilot projects for new technologies will accelerate their adoption.

10.5.5 Policy Development and Institutional Collaboration

Developing a national digital agriculture strategy aligned with Viet Nam's National Digital Transformation Program is necessary to guide the sector's transition. This strategy should emphasise precision agriculture, smart farming, and the integration of e-commerce into agricultural trade.

Enhancing policy implementation capacity is equally crucial. Government officials at all levels should receive training to effectively execute digital agricultural initiatives. Adequate funding must be allocated to approved programmes and projects, and existing policies should be streamlined to minimise redundancy and inconsistencies.

Intergovernmental and international co-operation must also be strengthened. Greater collaboration between ministries and public-private partnerships will ensure policy coherence and resource optimisation. International partnerships and regional collaborations should be promoted to share best practices and technological advancements. Leveraging international resources will further facilitate research and the application of digital technologies in agriculture.

10.5.6 Developing the Digital Agricultural Ecosystem and Strengthening the Value Chain

A well-functioning digital agricultural ecosystem is essential for optimising value chains. E-commerce platforms should be developed to connect farmers with suppliers, buyers, and consumers. These platforms should offer real-time market information, digital payment systems, and transparent supply chain tracking to enhance market efficiency.

Blockchain technology should also be widely adopted for product traceability. Encouraging the use of blockchain in supply chains will enhance transparency, ensure food safety, and strengthen consumer trust, particularly for key export products such as coffee, tea, and fruits. By implementing these comprehensive measures, ASEAN's agricultural sector can undergo a successful digital transformation, ensuring sustainability, efficiency, and resilience in the long term.

10.6 Conclusion

The rapid advancement of digital technology presents both opportunities and challenges for Viet Nam's agricultural sector. This report highlights key institutional, technical, and financial barriers hindering the widespread adoption of digital solutions. Whilst the government has demonstrated strong commitment through various policies and initiatives, gaps remain in policy implementation, digital infrastructure, data security, and stakeholder collaboration.

Survey findings reveal that limited institutional support, fragmented policy frameworks, and inadequate digital literacy amongst farmers and co-operatives continue to constrain technology adoption. Additionally, challenges related to data management, cybersecurity, and private sector engagement underscore the need for a more comprehensive and co-ordinated approach to digital transformation in agriculture. Expanding financial incentives, strengthening capacity-building programmes, and enhancing public-private partnerships are crucial for overcoming these barriers.

To foster a sustainable digital agricultural ecosystem, this study underscores the importance of high-speed internet expansion, integrated data ecosystems, and blockchain-based traceability solutions. Furthermore, targeted investment in research, innovation, and knowledge-sharing mechanisms will ensure that digital tools effectively address local agricultural needs.

Ultimately, a multi-stakeholder approach involving government agencies, private enterprises, research institutions, and international partners will be essential to accelerating Viet Nam's agricultural digitalisation. By addressing existing bottlenecks and leveraging emerging digital technologies, Viet Nam can enhance agricultural productivity, resilience, and global competitiveness in the years to come.

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